High Efficiency Adsorption of Methane Using Modified Activated Carbon and Modified Clinoptilolite

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Methane is a major driver of global climate change, 84 times more potent than carbon dioxide.The annual global methane emissions are around 570 million Tonnes.However, methane provides more energy by mass than any hydrocarbon, which makes it a significant energy source. The available mechanisms used to capture methane physically and chemically appear to be ineffective and of high costs. This study aims to prepare the best adsorbent of CH4 with the highest adsorption efficiency using these two adsorbents (Activated Carbon and Clinoptilolite). The study methodology contains three parts. First, modification of Activated Carbon with Copper and Silver metals to increase the adsorption capacity, as well as the modification of Clinoptilolite with Sodium and Potassium metals. Second, testing the adsorption capacity of each of the prepared modified samples (Ag-AC, Cu-AC, K-Cp, Na-Cp, Ag-AC/K-Cp mixture) in order to find the suitable adsorbent with the highest adsorption capacity. Third, testing the adsorbents' efficiency in decreasing the concentration of methane, using a sensitive CH4 concentration reader. The results showed that the most suitable adsorbent prepared is Ag-modified Activated Carbon, which has the highest adsorption capacity of 404.4mg/g, and decreases the concentration of methane about 97.6%. In addition to its high surface area per gram. Our prepared adsorbents showed higher efficiency in capturing methane compared to the previous studies and solutions. After all, applying our cost-effective modified adsorbent as a filter to trap methane is the best solution towards decreasing the global warming and greenhouse effect caused substantially by methane. Not to mention, the trapped methane can be reused in eco-friendly applications such as a renewable energy source.

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